Exceptional service in the national interest

Sandia **LabNews**





Sandians Ken Holley and Conrad James win Black Engineer of the Year awards

Sandia recruiter Ken Holley has won a BEYA Community Service award and researcher Conrad James has won a BEYA Special Recognition award. See the stories on page 8.



Nondestructive Testing Sandia looks inside composites

By Sue Major Holmes

esearcher David Moore holds a rectangle of hard carbon composite material, smooth with a faint woven pattern on its surface. The sample shows normal wear and tear until he turns it over to reveal a circular impact mark with cracks radiating from it.

The question for David (1522), his Sandia colleague Timothy Briggs (8222) in California, and their teams is whether the impact caused significant, hidden damage inside the composite. They're developing nondestructive ways to detect damage in composites, using traditional medical inspection techniques such as X-rays and sonograms and advanced methods including infrared imaging, ultrasonic spectroscopy, and computed tomography.

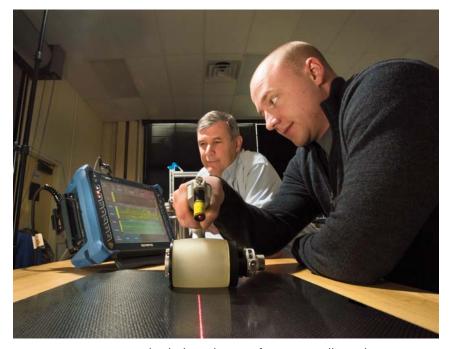
Must survive for decades

Sandia began studying composites several years ago to see whether the lightweight materials could be used in national security applications. While a composite in a cell phone needs to last only a couple of years, "typically materials for national security applications must survive for decades. This makes you think differently about where and why you would use a

material," David says. "We need to study the lifecycle of a component. We tend to think deeply about the consequences of fracture or deformation and how we can verify what happened."

The work also supports many aspects of Sandia's broader national security mission, including energy efficiency and performance improvements in lightweight vehicles or wind turbine blades, Timothy says.

Composites join separate materials with different characteristics. They often consist of a polymer matrix with reinforcing fibers like carbon, Kevlar, or glass. Composites can use bundles of thinner-than-a-hair carbon strands that yield a high strength-to-weight ratio. The final shape and strength is obtained after heating the part in an industrial oven that sets the poly-



BELOW THE SURFACE — Technologist Andrew Lentfer passes a roller probe over a composite as researcher David Moore (both 1522) checks data on a screen. The nondestructive testing technique sends sound waves into the composite material, returning data with each swipe of the roller. (Photo by Randy Montoya)

mer resin and yields the qualities necessary for a structural component.

Composites are increasingly important in aerospace and other industries because they're strong and weigh less than metals. Most can be bonded to metal for such uses as aircraft wings, making planes lighter and less expensive to fly.

No hint at what's inside

"We have a rich history of understanding metals and their failure mechanisms," David says. "Composite materials are very different."

If a service truck backs into a composite aircraft fuselage, an examination of the impact site might not detect damage under the surface. That highlights the reason for nondestructive techniques that can fully evaluate how composites react in various circumstances.

The research team is assessing the accuracy of nondestructive methods and how they could be used on a production floor. "You have to know what could go wrong in the processing steps and how to circumvent those, and then you want to make sure if you're going to make one or a hundred or a thousand that you're making them the same way all the time," David says.

"Once we establish the limits of detectability, the threshold of good, bad, and question-

able, we'll be able to say, 'We want this composite bonded to this material with a defined quality and it shall be inspected with this technique," he says.

Studying deformation, fracture, and damage growth

Sandia's Lightweight Structures Lab defines and consolidates materials to study, using particular stack sequences of composite material layers to tailor strength and stiffness. It works in concert with the National Security Campus in Kansas City in everything from developing process methods to building prototypes to qualifying designs for particular applications.

After making composites, the fabrication lab cuts out specimens for instrumented experi-(Continued on page 4)

Decon, bombs, and above and beyond

Sandia takes home three national tech transfer awards

By Nancy Salem



Federal Laboratory Consortium for Technology Transfer

Sandia won the national Federal Laboratory Consortium's (FLC) 2016 Award for Excellence in Technology Transfer for a decontamination product that neutralizes chemical and biological agents and for software that helps emergency responders more effectively disable improvised explosive devices (IEDs). And business development specialist Bianca Thayer (8549) was named Outstanding Technology Transfer Professional of 2016.

The awards recognize employees of FLC member laboratories and non-laboratory staff who have accomplished outstanding work in the process of transferring federally developed technology. A panel of experts from industry, state and local government, academia, and the federal laboratory system judge the nominations.

Bianca's award, one of the FLC's highest honors, recognizes one person who demonstrated outstanding achievement transferring a technology significantly over and above what was called for in the normal course of work.

'Sandia is truly honored to be recognized by our peers for our work in technology transfer," says Jackie Kerby Moore, manager of Technology and Economic Development Dept. 1933 and Sandia's representative to the FLC.

"Congratulations to Bianca and the Sandia teams who are being acknowledged for their accomplishments."

A passion for tech transfer

Bianca started her Sandia career five years ago as a licensing executive in Albuquerque after working 30 years in industry. She has negotiated new industry and academic partnerships and transferred a wide range of Labs technologies through licensing and cooperative research and development and Work for

Others agreements. She also developed the TEDS courses for intellectual property and licensing and has personally trained many technical staff on the value of IP.

in Japan.

BUSINESS BOOSTER

Bianca Thaver negotiated

the patent license in 2012

that led to UOP Honeywell

using Sandia's crystalline sil-

ico-titanate technology to

remove radioactive cesium

from contaminated seawa-

ter after the Fukushima

nuclear power plant disaster

Among Bianca's successes was negotiating the patent license in 2012 with UOP Honeywell for crystalline silicotitanates used to remove radioactive cesium from contaminated seawater following the Fukushima nuclear power plant disaster in Japan. She also negotiated numerous new licenses for Sandia's decontamination technol-

(Continued on page 5)

Ice sheet modeling

A team of Sandia researchers has been improving computational models that describe ice sheet behavior and dynamics. The research is part of a five-year project called Predicting Ice Sheet and Climate Evolution at Extreme Scales. Story on page 3.





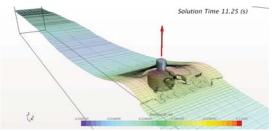
Sandia/California marks its 60th anniversary in March. To commemorate this milestone, several events are being planned throughout 2016 to highlight the site's accomplishments. Story on page 3.

Grid modernization

Sandia is leading the Security and tion Laboratory Consortium and bringing its strong research capability in grid modernization to help the nation modernize its power grid. Story on page 4.



Making waves



Sandia's water power technology group will provide critical expertise in computational modelling to companies on the forefront of the emerging marine hydrokinetics industry, thanks to a \$10.5 million dollar award from DOE. Story on page 5.

That's that

Do you remember the thrill you felt when you were maybe 5 or 6 years old, the sheer joy you knew in that glorious moment when the training wheels came off and your big brother or sister pushed you on the shiny red Schwinn and you glided down the driveway, unbound from the earth, free as a bird, the handlebars wobbling and your little feet cranking furiously, your teeth gritted in focused determination, and then everything coming together in perfect synchronicity, the bike coming upright and you zooming away, smooth as silk, up and down the street to the sounds of cheers and claps and whistles? Do you remember?

Bicycles were freedom in steel and rubber, magical devices for escaping the limitations of space and time, limitations that had confined your wonderings and wanderings to the sightlines from your own front door.

As we grow up, most of us find other passions, but for some, that first love affair with personal transportation technology is the one that lasts.

I want to tell you a story about such a love affair, one whose ending hasn't been written yet; maybe we can all help write it.

A lot of Sandians ride their bikes to work. I know one researcher who's been here for more than 50 years who has two-wheeled it to and from his lab almost every day, rain or shine, since the morning he hired on back when John Kennedy was president.

Some of us are fair-weather riders: We get our bicycles out of the garage on those golden Goldilocks days in the spring and fall when it's not too hot and not too cold, but just right, and make a leisurely pedal to work. For a few moments or miles, we are transported back to our first forays on two spoked wheels, back when we and the world were young.

Those are the times when we think, "This is the only way to go!"

Whether it is passion or simple nostalgia that inspires us to take to the road on our bicycles, we need to recognize that we are potentially putting ourselves into harm's way. It shouldn't be that way, but it is. And when we, as drivers, approach bicyclists we are potentially putting them in danger.

In the abstract, we all know the risks of cycling - there's a very good reason for helmets - but recently my wife and I had occasion to see up close and personal just how painful the real world can be when you put bikes and cars in the same space at the same time.

Our neighbor, Nathan Barkocy, is a 16-year-old young man with very realistic prospects of someday competing in the Tour de France. Yes, he's that good, already a champion racer with a growing national reputation. Two weeks ago, during a training ride, Nathan was struck by a car and critically injured. His helmet probably saved his life, but as I write this he's still in a coma. When he does emerge from it - and his medical team is optimistic that he will - Nathan has a long road to recovery ahead of him.

His network of friends is enormous and that helps a lot. Thousands of people, young and old and literally from around the world, are pulling for him, praying for him, offering an immense outpouring of support that has been a priceless gift for his parents.

Nathan, by the way, is the grandson of two Sandia retirees — a grandfather on each side - so he is very much a part of our extended Labs family.

Nathan's parents have been very open about the accident. "You hear about these tragedies that happen in our community way, way too often," his father, Kevin, told a reporter for KOB-TV. "But to see it in your own child just tears your heart out."

Nathan grew up next door to us. We welcomed him on his very first day on this Earth and, yes, we watched him learn to ride a bike, a skill he picked up with gleeful precociousness. I remember seeing his joy then, the joy $\bar{\text{I}}$ remembered from my own childhood, and I saw, too, that same joy radiate from him every time he headed out for a ride.

Nathan is a wonderful young man and a good friend to our family. As he continues his road to recovery, I hope you can pause for a moment to send his way your prayers if you pray, and your positive thoughts and energy. I've seen how much it means for his parents; I've seen how much it means for his grandparents. I know it helps them and I believe it helps Nathan, as well.

And one day, after weeks in a bed where he fought the fight of his life, I fully expect and plan to see Nathan climb back on his bike, a brave young hero, free as a bird, wobbly at first, but then getting the feel, finding again the familiar balance, and zoom, smooth as silk, up Robin Avenue and away, away to the hills.

See you next time.

- Bill Murphy (MS 1468, 505-845-0845, wtmurph@sandia.gov)

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Sandia National Laboratories

http://www.sandia.gov/LabNews

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www-irn.sandia.gov/newscenter/interactive.

Important information about the Affordable Care Act 1095-C tax form

The Affordable Care Act (ACA) requires large employers to provide the 1095-C tax form to employees as proof of health insurance coverage. Once you receive your form, keep it as supplemental documentation for your 2015 tax records.



Employees

Forms will be available in HR Self-Service (if you optedin to electronic consent) or mailed by March 31.

PreMedicare retirees

If you were enrolled in Sandia Total Health in the Pre-Medicare retiree plan for any month in 2015, you will receive a 1095-C form from Sandia National Laboratories by March 31. Once you receive your form, keep it as supplemental documentation for your tax records.

If you were not enrolled in Sandia Total Health in 2015, you will not receive a form from Sandia National Laboratories.

Medicare retirees

Medicare Retirees will not receive a 1095-C from Sandia National Laboratories.

Form 1095-C and your taxes

When preparing your taxes this year, look for the line referencing "health care: individual responsibility."

If you (and your dependents, if applicable) were enrolled in Sandia Total Health for all of calendar year 2015, your coverage meets the minimum essential coverage requirement and you should check the box for "fullyear coverage." No further action is required. Note: You do not need to submit form 1095-C with your tax return.

If you (and your dependents, if applicable) were not enrolled in Sandia Total Health for all of calendar year 2015, you may not have reached the minimum essential coverage requirement. Check the IRS website or talk to your tax professional to find out if your coverage qualifies.

If you have any questions, call HBE Customer Service at 505-844-HBES (4237).

Retiree deaths William Haraford (aga 00)

William Herelord (age 90) Nov. 4
Curtis Warthen (85) Nov. 12
Henry Austin (97) Nov. 13
Eddie Keller (103)
Michael Stark (69)
Gary Fisher (70)
James Novak (82)
Michael Young (67)
Eunice Becker (69) Nov. 26
Richard Striker (82) Nov. 28
Howard Arris (61)
Gerald Giovacchini (66) Dec. 2
H. Ludwig Reis (93) Dec. 2
Jonnie Finley (89) Dec. 3
Wilda Kamm (97)
Richard Chapman (80) Dec. 10
Robert Roth (77)
Marian Goddard (94) Dec. 16
Ted Hebebrand (74) Dec. 23
Joe Apodaca (87) Dec. 24
Judith Howard (72) Dec. 24
Larry Wright (69) Dec. 24
Peter Manley (68)
Joseph Teresi (97)
Glenn Morehouse (91) Dec. 28
Glenn H. Miller (95)
Oreste Puccini (94)
Patricia Wheeler (85) Jan. 1
William Caldwell (93) Jan. 3
Prospero Toledo (90) Jan. 4
George Dalphin (89) Jan. 5
Lawrence Nelson (81)

Sandia/California celebrates 60 years of science and service

This March marks Sandia/California's 60th anniversary. To commemorate this milestone, several events are being planned throughout 2016 to highlight the site's accomplishments and commitment to science and service.

The celebration will begin with an event focusing on the site's rich history on March 3 beginning at 2:30 p.m. in the Combustion Research Facility auditorium. At this anniversary celebration event, a panel of past Div. CALIFORNIA 8000 VPs including Rick Stulen (VP from 2009 to 2012), will commemorate the Labs' history and share memories of significant events of the site. After the panel discussion, attendees will be able to see

the different ways they can get involved in the

"Celebrating this anniversary with past site leaders will make this event truly special," says Div. 8000 VP Marianne Walck. "I hope our staff will attend the on-site celebration, because it will be great fun to hear the recollections of our former VPs, and also because the staff can see the various ways that Sandia is committed to the local community. Later this year, Sandia/California will

hold a community event in downtown Livermore. This event will bring together the community to get an inside look at Sandia and engage children and students in STEM activities. This event will feature a

series of speakers on the site's mission areas, displays of important Sandia technology, hands-on STEM activities for children, and opportunities to showcase STEM projects by area high school students.

Sandia opened the California site in Livermore in 1956. From a small group of employees, Sandia/California has grown to include some 900 staff and 250 contractors, postdoctoral fellows, and students. Building on a history of collaboration across disciplines and organizations, the site has grown and diversified to deliver a stream of critical contributions, including the precise engineering needed to modernize and secure the nation's nuclear deterrent, the science basis for making every car built today cleaner and more efficient, and portable, fast-acting technologies for detecting harmful chemicals and disease.

— Michael Padilla

Ice sheet modeling of Greenland, Antarctica helps predict sea-level rise

NATIONAL LABORATO

Michael Padilla

The Greenland and Antarctic ice sheets will make a dominant contribution to 21st century sea-level rise if current climate trends continue. However, predicting the expected loss Computing (SciDAC) program. PISCEES is a multi-lab, multiuniversity endeavor that includes researchers from Sandia, Los Alamos, Lawrence Berkeley, and Oak Ridge national laboratories; the Massachusetts Institute of Technology; Florida State University; the University of Bristol; the University of

Texas Austin; the University of South Carolina; and New York University.

Sandia's biggest contribution to PISCEES has been an analysis tool: a land-ice solver called Albany/FELIX (Finite Elements for Land Ice eXperiments). The tool is based on equations that simulate ice flow over the Greenland and Antarctic ice sheets and is being coupled to Earth models through the Accelerated Climate for Energy (ACME) project.

"One of the goals of PISCEES is to create a land-ice solver that is scalable, fast, and robust on continental scales," says computational scientist Irina Tezaur, a lead developer of Albany/FELIX. Not only did the new solver need to be reliable and efficient, but it was critical

that the team develop a solver capable of running on new and emerging computers, and equipped with advanced analysis capabilities for model calibration and uncertainty quantification.

"The data we get from climate scientists are usually measurements from the top surface of the ice," she says. "To initialize an ice sheet simulation, we need information about what is happening inside and at the bottom of the ice. Determining interior and bedrock ice properties is what we call model calibration, and requires the solution of an inverse problem. A lot of our work has been in developing and implementing optimization algorithms that are able to solve

these inverse problems robustly

and efficiently." She stresses that the success of CEES is due in large part to strong collaborations among glaciologists, climate modelers, computational scientists, and mathematicians.

"Glaciologists and climate scientist collaborators on PISCEES provide us with data sets to go into our model, while computational scientists come up with the right algorithms to use and implement them efficiently," she says.

Improving computational modeling

The PISCEES project began in 2012 because there was no robust land-ice model as a building block for earth system models that calculate sea-level rise predictions to support DOE's climate missions.

Exceptional service in the national interest **CaliforniaNews**

"In just three years of work, we have created a next-generation land-ice model that is verified, scalable, and robust and is portable to new and emerging architecture machines," she says. "These models are equipped with advanced analysis capabilities."

While code performance is critical to the success of Albany/FELIX, equally important are verification and validation, two procedures for evaluating a model and its code. Verification is aimed at ascertaining that it is bug-free. In contrast, validation is aimed at checking that the physical process described by a model is consistent with what is seen in the real world.

Sandia has done a thorough verification of the Albany/FELIX solver using the method of manufactured solutions, code-to-code comparisons on canonical land-ice benchmarks, and by performing convergence studies on realistic Greenland and Antarctica landscapes with real data.

Irina Tezaur explains that, in general, validation is much harder to do than verification. The degree to which ice sheet models have been validated by observations is fairly limited, due in part to the limited duration of the satellite observation era and the long adjustment time scales of ice sheets. The PISCEES team has checked that its solver predicts ice sheet quantities such as surface velocities, and surface mass balance, and that these quantities are consistent with past and recent observations.

"We are in the process of doing a validation study for the Greenland Ice Sheet for the period 1991-2012," she says. "The ice sheet model output will be compared to ice surface elevation and ice sheet mass change observations from ICE-Sat, the Ice, Cloud and land Elevation Satellite."

Early results show promise for assessing the performance of different model configurations. A verification and validation test suite, known as the Land Ice Validation and Verification Kit, is being developed by PISCEES collaborators at Oak Ridge National Laboratory, and goes hand-in-hand with efforts performed at Sandia.

In recent months, climate scientists Steve Price and Matt Hoffman at Los Alamos have begun to use Albany/FELIX for production runs on Edison and Cori, two of the newest Cray supercomputers at the National Energy Research Scientific Computing Center. During the next two years, calculations provided by the team will be used to estimate expected sea level rise during the 21st century.



ICE SHEET MODELING TEAM - From left to right, Mike Eldred (1441), John Jakeman (1441), Irina Demeshko (1426), Mauro Perego (1442), and Andy Salinger (1442) are part of the team that has been improving the reliability and efficiency of computational models that describe ice sheet behavior and (Photo by Lloyd Wilson)



of ice sheet mass is difficult due to the complexity of modeling ice sheet behavior.

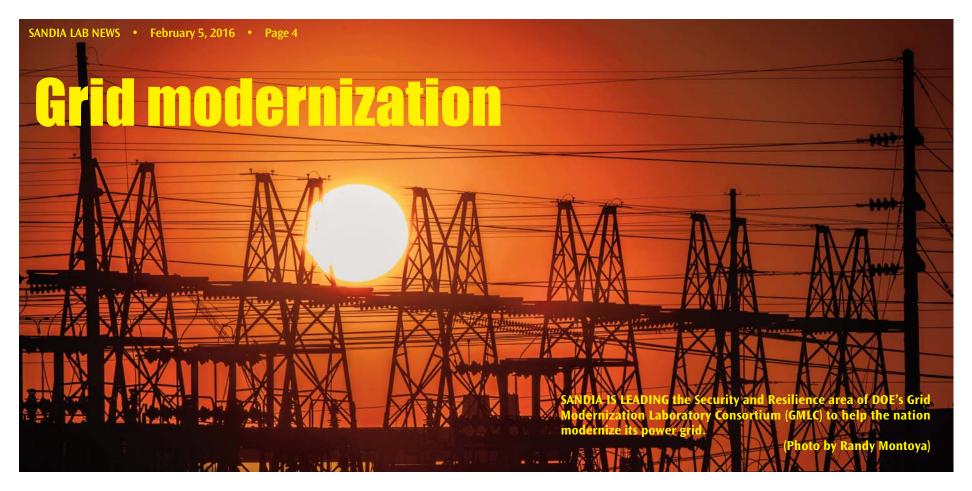
To better understand this loss, a team of Sandia researchers has been improving the reliability and efficiency of computational models that describe ice sheet behavior and dynamics. The team includes Irina Demeshko (1426), Mike Eldred (1441), John Jakeman (1441), Mauro Perego (1442), Andy Salinger (1442), Irina Tezaur (8954), and Ray Tuminaro (1442).

This research is part of a five-year project called Predicting Ice Sheet and Climate Evolution at Extreme Scales (PIS-CEES), funded by DOE's Scientific Discovery through Advanced

The Albany/FELIX solver was written using the so-called "Agile Components" software development strategy, an approach advocated by PISCEES Sandia principal investigator Andy Salinger (1442), in which new application codes are written using mature modular libraries. New solvers created using this approach are "born" scalable, fast, robust, and capable of advanced analysis since they are based on a collection of world-class algorithmic capabilities developed and tested

Albany/FELIX: Agile components and novel approaches

The components comprising Albany/FELIX are the Trilinos libraries, a collection of open-source packages developed at Sandia. In addition to recommending and executing the "Agile Components" code development strategy, the Sandia PIS-CEES team has developed approaches for improving the robustness of the nonlinear solver using homotopy continuation. The Albany/FELIX code has demonstrated scalability up to one billion unknowns and tens of thousands of cores thanks to parallel scalable iterative linear solvers and newly developed preconditioning methods by Ray Tuminaro (1442). Adjoint-based deterministic inversion algorithms and software developed and implemented by Mauro Perego (1442) have enabled rigorous model calibration. In collaboration with experts from the QUEST SciDAC institute, Mike Eldred and John Jakeman (both 1441), a framework for forward and inverse uncertainty quantification (UQ) has been developed. Finally, Albany/FELIX has been made portable to new architecture machines thanks in large part to the efforts of computer scientist Irina Demeshko (1426).



By Stephanie Holinka

andia is leading the Security and Resilience area of DOE's Grid Modernization Laboratory Consortium (GMLC) and bringing its strong research capability in grid modernization to help the nation modernize its power grid.

The consortium includes scientists and engineers from across 14 DOE national labs and dozens of industry, academic, and state and local government partners, aligned into six technical areas. These teams come together to imagine the grid of the future and to close high-priority technology and security gaps facing the US power grid as it deals with growth, disruptive operating changes, and future threats. GMLC research and development will receive up to \$220 million in funding over the next three years through DOE's Office of Electricity Delivery and Energy Reliability and its Office of Energy Efficiency and Renewable Energy.

The task is not simple. The grid must deliver reliable, affordable, and clean electricity to consumers where they want it, when they want it, and how they want it. And it must be secure against many different types of physical and cyber intrusion threats, as well as natural disasters and severe storms and hurricanes.

Juan Torres (6120), deputy director for Sandia's Renewable Systems and Energy Infrastructure Program, leads the

GMLC's Grid Security and Resilience team, a 12-lab team tasked with developing a multiyear program plan for research necessary to keep the increasingly interconnected electric power grid secure and resilient.

"Sandia has decades of experience in physical and cybersecurity, and in providing resilience support for the power grid and some of the most critical infrastructures in the nation."

"Sandia has decades of experience in physical and cybersecurity, and in providing resilience support for the power grid and some of the most critical infrastructures in the nation, such as nuclear power plants, oil and gas installations, and water and transportation systems," Juan says. "Sandia's capabilities, coupled with assets at our partner labs, bring tremendous resources for the nation."

Charles Hanley, senior manager of Grid Modernization and Military Energy Programs Dept. 6110, is leading Sandia's participation in the CMLC

participation in the GMLC.

"Sandia engineers and scientists are excited to be apply-

ing decades of technology leadership in national security

areas to help create a modern electric grid. The GMLC is an excellent avenue to increase our technical collaborations and ensure a broad national impact for this critical work," Charles says.

Sandia engineers will lead several projects, including:

- The GMLC Testing Network, which will create a comprehensive testing infrastructure and a repository of models and simulation tools to help accelerate grid modernization.
- The Grid Analysis and Design for Energy and Infrastructure Resiliency for New Orleans project is intended to assist coastal cities that experience extended power outages exacerbating interruption of energy intensive infrastructures vital to recovery during hurricanes and storms.
- A project in Vermont to help utilities meet that state's ambitious goal of obtaining 90 percent of its energy from renewable sources by 2050.

Sandia also will support projects in New Mexico, Kentucky, Alaska, and Hawaii, and will be part of broad teams on numerous other technology development projects under the GMLC program.

Ultimately, the consortium will help develop a unified grid modernization strategy for DOE, in partnership with utilities and other grid stakeholders, and will support implementing that strategy using the strong technical and institutional knowledge and capabilities present across the national laboratory complex.

Non-destructive

(Continued from page 1)

ments — abusing the carefully made sample to study deformation, fracture, and damage growth. Timothy "pulls, stretches, torques, and crushes them. He performs these mechanical experiments so we can understand the fracture mechanisms around failure," David says. "Then we try to detect some of those failure modes."

Helps computer modeling, simulation

"The fundamental characterization of composites measures material properties and structural characteristics, which in turn provides information to validate computer modeling and simulation," Timothy says.

Data from these destructive tests is correlated with nondestructive evaluations from David's team to understand what caused the material to respond the way it did, Timothy says. The effort hinges on close collaboration with Sandia's materials characterization groups and modeling and simulation colleagues to help validate their computer-based simulations.

Composites must support a particular weight and size. "Anyone can build a structure to carry the load, but we have to design our structures to fit within a geometric envelope and be lightweight," Timothy says. "We cannot simply overengineer to unrealistic levels. We have to be very smart and efficient with our designs, yet provide enough margin for long-term reliability."

Materials bonded in an oven or autoclave often have different thermal expansion rates — aluminum expands more than fiber-reinforced plastics, for example. Once a composite cools after curing, residual stresses can build up inside,

particularly at interfaces. If the composite can't handle those stresses, the bonds can fail.

Sandia is developing advanced techniques to complete sample inspections in less than 5 minutes in some cases. "This is a way to gain a lot of information very quickly about the quality of the bonds," David says.

Studying specific nondestructive techniques

His team uses the deliberately mistreated composites to assess such inspection techniques as advanced ultrasonics, flashed or active thermography, and computed tomography.

Ultrasonic testing has been around for 60 years, but computers and other improvements now allow study of more complex applications. Technologist Andrew Lentfer (1522) demonstrates, scanning a piece of composite with a handheld ultrasonic roller that resembles a small paint roller with a hollow, water-filled barrel. As he scans the composite's layers, a computer screen maps them in color: Yellow-green is OK; blue indicates weakness. Rollers can scan curved surfaces, even large ones like airplanes.

Fibers and interfaces in a composite scatter ultrasonic waves moving through the material. David compares it to ocean waves: "If a wave hits a rock face in the ocean it moves around it; if a wave washes up on the sand it gets absorbed; and if it hits a seawall the wave energy is redirected quickly. Those are the same fundamentals we investigate: ultrasonic energy moving through a composite matrix."

Knowledge gained from characterizing materials helps develop new nondestructive techniques "so when we establish an inspection criteria, we have a better feel for what we can detect and what we cannot," he says.

Flashed thermography, commercially available for more than 20 years, flashes very high-energy light onto a surface for 15 microseconds, then an infrared camera watches how the surface cools. The process takes only minutes.

"It's very fast, but you have to understand the fundamentals of heat flow and how the material surface either gives off heat to its surroundings or transfers heat within itself," David says.

Comparing good, not-so-good composites

The research uses composites with high-quality bonds and others deliberately made with weaker bonds. Differences in results help the team improve detection of defects or damage. A computer screen shows light or dark spots indicating possible problems, and an overlaid graph ties the depth of the potential problem to the time indicated on the image.

"The question becomes, is that a concern? Is that a crack or not?" David says. "We'll be able to answer those questions. If the defect propagates deep into the material, we may not detect it. It's wise to understand the capabilities of the technique and then perform the math and science behind it."

Computed tomography systems are efficient for finding small defects. The technique rotates a sample 360 degrees while taking 1,000 images, similar to a medical CT scan, and generates an image from each thin slice of the object. Since each image taken is two dimensional, computer algorithms reconstruct, calculate, locate, and display everything to represent the object in three dimensions.

"Once the 3-D image is reconstructed, you look at the front surface and then start moving through the thickness to view what is below the surface," David says. "This technology gives us a knowledge baseline and validates how the other techniques are performing."

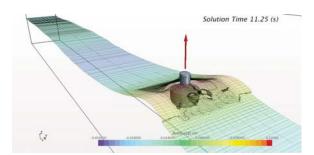
Sandia must ensure designs meet requirements by specifying and qualifying an inspection technique, and now is writing inspection procedures for the National Security Campus, David says. "Once we establish criteria and limits of acceptability, the product definition can be established," he says.

Sandia making waves in marine energy systems

By Rebecca Brock

Sandia's water power technology group will provide critical expertise in computational

modeling to companies on the forefront of the emerging marine hydrokinetics industry, thanks to a \$10.5 million dollar award from DOE. The award will help six US companies improve the design and operation of wave energy converters (WECs) to harness clean, renewable energy from waves, tides, ocean currents, and the natural flow of water in rivers. Marine and hydrokinetic systems are a largely untapped industry



EXTREME CONDITIONS MODELING is an essential step in the design process of wave energy converters (WECs) to accurately predict how the devices will respond to wave overtopping, large motions, and wave slamming.

that has the potential to power up businesses and homes across the nation's coastal regions. Sandia research engineer Ryan Coe (6122) is the principal investigator on the extreme conditions modeling project. Ryan and researchers from Sandia's water power technology group will partner with National Renewable Energy Lab to provide numerical modeling solutions, a framework to help companies design systems that can survive harsh marine conditions.

Ryan says, "It is exciting for us to take this research to another level of fidelity and detail by working with these private companies on their WEC devices. The hope is that our work will not only benefit them, but that we also will learn a lot of important information in the process which gets cycled into our knowledge at Sandia."

Companies with WEC projects funded by the new DOE award include Dehlsen Associates LLC of Santa Barbara, California; M3 Wave LLC of Salem, Oregon; and Oscilla Power Inc. of Seattle, Washington.

One of the challenges these companies in the emerging wave energy field face, Ryan says, is that wave tank testing is expensive. Sandia's modeling resources will save them time and money, he says, by equipping them with loads of data to help limit their time in the wave tank and make better usage of the time spent there.

What are extreme conditions in WEC modeling? Contrary to what comes to mind, Ryan says it is not always defined as one big wave, like a tsunami. It is a set of conditions that causes major stress on the device. "The ocean is a really random place made up of waves that

Designing the city of tomorrow



THE TEAM OF DELTA CITY from Albuquerque's Annunciation School won first place in the New Mexico region of the annual Future City competition, earning the right to represent the region Feb. 13-17 in Washington, D.C. The team's project took the top spot among 17 teams Jan. 16 at the regional competition at the New Mexico Museum of Nuclear Science and History. The theme of this year's competition, Waste Not, Want Not, centered on the critical role of waste management in today's urban environments. Future City, a program of DiscoverE, each year asks middle schoolers to come up with innovative solutions to a challenging problem. Among the competition sponsors are Lockheed Martin Corp., Sandia National Laboratories, Los Alamos Security LLC, Los Alamos National Laboratory, and the museum. To learn more, visit www.futurecity.org.

are constantly overlapping each other. So to analyze an extreme condition, we might look at a series of somewhat smaller ocean waves that are set up with just the right spacing to come along and clobber the device," Ryan says.

Along with the extreme conditions modeling project, Sandia's water power technology group is well underway with phase 1 of experimental testing on Wave Energy Converter SIMulator (WEC-Sim), a numerical modelling project testing at Oregon State University's Hinsdale Wave Research Laboratory. WEC-SIM, an open source code for modeling the performance of wave energy converters, begins phase 2 of testing in the spring.

Both projects contribute to the nation's energy security by making wave energy more economically feasible.

FLC awards

(Continued from page 1)



CLEANING UP — Researcher Mark Tucker (6632) demonstrates Sandia's decontamination formula. The product, used 15 years ago to disinfect facilities following the deadly 2001 anthrax attacks, is now being used by a variety of companies to clean meth labs and other toxic sites. (Photo by Randy Montoya)

ogy resulting in more widespread use of the product.

Her manager, Carrie Burchard, says Bianca, who transferred to Sandia/California in 2013, "is constantly thinking of new ways to help her licensees be successful in commercializing technologies from Sandia. She's got a true passion for technology transfer."

Decon technology licensed to companies

Decontamination Technology for Chemical and Biological Agents, which also won a Far West/Mid-Continent regional FLC award last year, uses a mix of mild, nontoxic, and noncorrosive chemicals found in common household products such as hair conditioner and toothpaste. It contains both surfactants that lift agents off a surface and mild oxidizers that break down the agent's molecules into nontoxic pieces that can be washed down a household drain like detergent or dish soap.

The product works quickly and kills 99.99999 percent of bacteria, viruses, and fungi. Originally used by the military and first responders, Sandia has licensed the formula to companies that have developed it to battle toxic mold and

decontaminate meth labs, disinfect healthcare facilities and schools, remove pesticides from farm equipment and agricultural packing plants, and fight the spread of the Ebola virus in Africa. It also has been used as a preventive measure at presidential debates and a political convention.

Sandia has promoted the technology, worked with companies to license and commercialize it, and adapted it for new products and uses. Seven new licensees are manufacturing and distributing products based on the Sandia decontamination patents. Efforts continue to add more licensees and product applications.

The decontamination formula was developed with funding from DOE and NNSA's Chemical and Biological National Security Program. And Sandia's Laboratory Directed Research and Development (LDRD) program has supported a variety of projects involving decontamination systems.

A standard in the bomb disposal field

X-Ray Toolkit (XTK) is a software program developed by Sandia for the federal government with funding from NNSA and the Technical Support Working Group. The image processing and analysis software helps emergency responders better perform in the high-stress, time-critical act of disabling IEDs.

It has become the field standard due in part to being easy to use and built specifically for explosive ordnance disposal (EOD) personnel. A unique multifaceted deployment model contributed to its rapid and widespread acceptance.

XTK replaced multiple-imaging software packages EOD teams used with X-ray scanners. Sandia developers spent hundreds of hours with teams learning how they work, and designed an application that is intuitive, versatile, compatible with most X-ray scanners, and better suited to the needs of bomb disposal technicians.

Sandia also designed the patented Grid-Aim system as an optional hardware accessory kit for XTK. Grid-Aim lets users precisely disrupt and disable the internal components of an IED while preserving the rest of the device for evidence and minimizing damage to surrounding property and infrastructure.

To get XTK to the people who need it, Sandia offered nocost end user licenses and free test and evaluation licenses for scanner manufacturers. Creative technology transfer methods helped XTK spread through the emergency response community. It is estimated to be in the hands of more than 20,000 users in most of the 467 recognized non-military bomb



TRICKY PURSUIT — Explosive ordnance disposal technicians use Sandia's XTK software to help analyze and disable an improvised explosive device. XTK is estimated to be used by more than 20,000 people in most of the 467 recognized non-military bomb squads across the country.

(Photo by Jeff Hoffman/Honeywell)

squads across the US. It also has been adopted by the FBI's Hazardous Devices School for all its courses.

Sandia saved the emergency response community millions of dollars in licensing fees and training costs by offering the software free of charge and developing efficient ways to supply the XTK application, hardware accessories, and training.

The FLC is a nationwide network of about 300 members that provides the forum to develop strategies and opportunities for linking laboratory mission technologies and expertise with the marketplace.

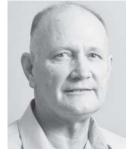
The FLC Awards Program annually recognizes federal laboratories and their industry partners for outstanding technology transfer efforts and has become one of the most prestigious honors in technology transfer. Since its establishment in 1984, the FLC has presented awards to more than 200 federal laboratories.

"Decon technology and the X-Ray Toolkit are great examples of how Sandia's scientific research translates into products that benefit the public," says Pete Atherton, senior manager of Industry Partnerships Dept. 1930. "We look forward to working with partners to make these and other innovations widely available, and Bianca is one of our team members who has demonstrated outstanding achievement transferring technologies."

Mileposts



New Mexico photos by Michelle Fleming



Mark Montavon 5424



Alicia Cloer 35



10595



New Mexico photos by Michelle Fleming

5959

5700

Recent Retirees



Phil Dreike



Linda Gallagher 6614



John Mareda 35



Dennis Croessmann 1520



Tommy Teague

6525



Alice Vandevender 1533



5700

4842

5425

10243

Ron Hoskie 30



5791

Dan Kral 30



9537

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1522

Randy Montoya 30



Michael Saavedra 1832 30



Charles Ringler

39

Grant Bloom 410



John Williams



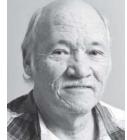
Rick Hartzell 36



Brent Sims



Vincent Hietala 5638



Fred Bauer



Troy Gourley 15 5782



Jeana Brosseau 35 11000



Belinda Holley



6513

Bill Chambers 157



Marlene Lucero



Sara Lucero



10512



Ann Mattsson 15 1444



Rod Nagel 15

5786



Spencer Luker 1384



Ron Allman 1118



700

1210



Daniel Roberts 15



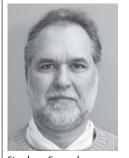
Mike Shaw 15



Steve Todd 15



Michael Wanke 1118 15



Stephen Conrad 26 6920



1523 26



Paul Raglin 25



1. Bldg. 802, elevator lobby 6. Bldg. 892, lobby

3521



Lab News is available in news racks at 24 locations throughout the Labs. A digital version of Lab News continues to be available on Tech Web as well as on Sandia.gov.

5437

2. Bldg. 810, east lobby 3. Bldg. 822, south entrance 4. Bldg. 858 EL, lobby 5. Bldg. 880, Aisle D, north

7. Bldg. 894, east entrance, lobby lobby 8. Bldg. 898, east lobby 9. Bldg. 887, lobby 10. Bldg. 891, lobby 11. Bldg. 836, lobby

12. Bldg. 831/832 north 13. Bldg. 861, cafeteria lobby 14. Bldg. 870, lobby 15. Bldg. 701, 1st floor hall, next to elevator

1719

16. IPOC, lobby 17. CGSC, lobby 18. CRSI, lobby 19. M.O. 308, lobby 20. Bldg. 960, lobby 21. Bldg. 962 (TA III), lobby 22. Bldg. 6585 (TA V), lobby

LabNews Locations

23. Bldg. 905, lobby 24. 800(A), outside of Vicki's 25. Bldg. 905, lobby



Damaris Hill 5417



John Shaw 9515



SANDIA CLASSIFIED ADS

MISCELLANEOUS

- PILATES EXERCISE CHAIR, \$250; southwest chair, \$75; office desk, \$550. Scott, 505-301-6554.
- SOFA & LOVESEAT, Highlife furniture, dark brown, suede, 1 yr. old, like new, lightly used w/seat covers, \$600/both. Martinez, 417-3242.
- XBOX 360 S, 4 GB, 3 wireless controllers, w/17 working games, \$332.52. Washburn, 890-1230, ask for Daniel.
- TREADMILL, NordicTrack, excellent condition, originally \$1,100, asking \$300. Hilker, 896-3430.
- TOTAL GYM, very sturdy, used kindly, \$100 OBO. Ghanbari, 400-4188.
- TREADMILL, ProForm 400C, iFit, fan, iPod dock, like new condition, \$350. Mann, 505-235-9157.
- GIANT TEDDY BEAR, 93-in., Costco, better than flowers, \$250 OBO. Kunz, 402-616-6466.
- BABY GRAND PIANO, Samick, '02, paid \$6,000, asking \$4,500. Metzler, 565-2033, ask for Jim or Terri.
- PRINTER, Canon Pixma iP4300, works fine, not compatible w/new computer, needs new cartridges, \$50 OBO. Busse, 323-2812.
- PLAY SET, wooden, outdoor, 2 swings, fort, etc. & plastic playhouse, you haul, free; table saw, Sears, 10-in., w/accessories, good condition, \$150 OBO. Woodstra, 505-720-4782.
- WOOD INSERT, w/stove pipes/ hearth cover, good condition, \$500. Apodaca, 306-6161, ask for Barb.
- CAMPER SHELL, Ford, long bed, red, w/stand, \$350; used 265-70-18 tires, "E", \$80. Schroeder, 917-4516.

- MAHOGANY WOOD, 35 board feet, 7-13-in. wide, \$5/board foot, \$175. Reynolds, 980-4105.
- DOG STROLLER, Pet Gear AT3, 3 wheels, no zipper, folding, up to 75-lbs., almost new, \$130. Bullington, 505-797-5999.
- SKI TRAINER, NordicTrack Cross County, \$250; Yakima ski rack, for round tube rack, lockable, \$30. Fleming, 869-9165.
- 3D TV, Sony Bravia, XBR-46HX909, new, never used, original, unopened box, \$1,100 OBO; Ti-Vo Premiere, 320 GB, brand new, never used, original box, \$70 OBO. Lujan, 299-2218.
- HUTCH & ARMOIRE, dark cherry finish, \$700/both. Hennessey, 505-269-6243.
- GLASS-TOP TABLE, 21-1/2" tall, 28-in. round, beveled glass top, brass metal base, \$40. Dockerty, 828-0745.
- WASHER, Kenmore Elite, white, king-size capacity, \$150. de la Fe, 610-2700.
- FLAT SCREEN LCD TV, 24-in., GPX, 1920x1080, excellent condition, great for kid's room, \$50 OBO. Cioce, 201-575-0319.
- RAIN BARRELS, tan, 4 x 55-gal. ea., good condition, multiple valve & drain options, w/all fittings, photos available, \$50 ea. Brooks, 362-1828.
- SABLE GERMAN SHEPHERD, male, 9 wks. old, in Valencia Co., first shots, de-wormed, call for photo, \$400. Chavez, 505-357-4950.
- SOLAR WATER SYSTEM, whole house, 6 panels, pumps, heat exchanger, \$4,000; used WHSE30 water softener, \$100. Lebien, 505-459-4074.
- COFFEE & END TABLES, matching, solid wood, glass tops, photos available, \$75/set; dishwasher, kitchen faucet hookup, \$100. Wimpy, 822-0223.

How to submit classified ads

DEADLINE: Friday noon before week of publication unless changed by holiday. Submit by one of these methods:

- EMAIL: Michelle Fleming (classads@sandia.gov)
- FAX: 844-0645
- MAIL: MS 1468 (Dept. 3651)
 INTERNAL WEB: On internal web homepage, click on News Center, then on Lab News link, and then on the very top of Lab News homepage "Submit a Classified Ad."
 If you have questions, call Michelle
- Because of space constraints, ads will be printed on a first-come basis.

Ad rules

- Limit 18 words, including last name and home phone (If you include a web or e-mail address, it will count as two or three words, depending on length of the address.)
- 2. Include organization and full name with the ad submission.
- 3. Submit ad in writing. No phone-ins.
- Type or print ad legibly; use accepted abbreviations.
- 5. One ad per issue.6. We will not run the same ad more than twice.
- No "for rent" ads except for employees on temporary assignment.
 No commercial ads.
- For active Sandia members of the workforce, retired Sandians, and DOE employees.
- Housing listed for sale is available without regard to race, creed, color, or national origin.
- Work Wanted ads limited to student-aged children of employees.
- We reserve the right not to publish any ad that may be considered offensive or in bad taste.
- 'JOSEPH AND THE AMAZING TECHNICOLOR DREAMCOAT' TICKETS, 2, April 21, 7:30 p.m., seats E303-E304, \$100/pair. Wood, 505-228-0193.
- ENGLISH SADDLE, close-contact, 15-in. seat, fully-equipped, rolled leather headstall w/bit, split reins, excellent condition, \$900. Rivers, 505-720-4701.

- WATER SOFTENER, whole-house, WaterSoft, model DS64TP, salt based, \$149. Sarsfield, 294-2578.
- TORO ELECTRIC SHOVEL, used once, \$150. Lawson, 505-244-3537.

TRANSPORTATION

- '09 FORD FOCUS, sedan S, FWD, 77K miles, well maintained, runs great, \$5,000. Glover, 505-440-0823, ask for Cheryl.
- '06 HONDA ACCORD EX, V6, 4-dr., navigation, leather, roof rack, 96K miles, good condition, must sell, \$7,500. Magill, 607-821-9117.
- '02 ACURA RSX TYPE S, 6-spd., silver, 1 owner, meticulous maintenance, 132.6K miles, < NADA, \$5,700. Sansone, 505-296-7945.
- '07 MITSUBISHI ECLIPSE SE, 63K miles, will send photos or view at KAFB lot on Texas St. \$7,000. Gutierrez, 505-934-2062.
- '07 PRIUS, desert gold, original owner, runs & looks great, 131K miles, dealer serviced, \$7,500 cash/certified check. Andersen, 299-1636.

RECREATION

- '99 COLEMAN POPUP TRAILER, sleeps 8, rear hitch, good heater, excellent condition, \$4,000. Clements, 865-3993.
- DIRT BIKES: '06 Honda CRF 50, \$750; '00 Honda XR100, \$850; both in good condition. Monk, 890-1132.
- MOUNTAIN BIKE, Trek Marlin 6, black/green, brand new, photos available, \$500. Garcia, 505-321-7763.
- HONDA CRF50CC MOTORCY-CLES, 2, '06 & '08, excellent condition, \$750 ea. Seals, 505-292-1367.

'84 BMW R100RS MOTORCYCLE, 2 seats, many engine modifications & extras, 100K miles, photos available, \$2,995. MacCormic, 967-7891.

REAL ESTATE

- 4-BDR. HOME, 3 baths, 3,500-sq. ft., Glenwood Hills, large lot w/RV access, \$469,900 OBO. Stephens, 249-7623.
- 3-BDR. HOME, 1-3/4 baths, long single-car garage, metal roof, cul-de-sac, Northeast Heights, \$135,000. Flores, 681-7081.
- CUSTOM HOME, Pueblo-style, updated, Siesta Hills community, close to KAFB/VA Hospital, 2,722-sq. ft., .38-acre lot, fabulous, \$375,000. Gilliland, 366-3217.
- 3-BDR. HOME, 2 baths, 1,376-sq. ft., 2-car garage, gated community, refrigerated air, 9109 Lower Meadow SW, \$129,900 OBO. Haltli, 514-9834.

WANTED

- LADY GOLFERS, join Tijeras Arroyo Women's Golf Association, season begins in February. Langdon, 505-263-9558, ask for Margaret.
- GOOD HOME, 2 roosters, need home away from 3rd rooster. Holden, 618-967-8957.
- TRAVEL TRAILER, small/medium, needing TLC, let me know what you have including price. Colombel, 505-225-6748.



New Mexico Middle School Science Bowl

By Mollie Rappe

BUZZERS READY? – More than 100 middle school students from schools across the state competed in Science Bowl on Jan. 23. Science Bowl features science and math questions in a lightning-fast quiz-bowl format.

What is the mathematical term for coplanar lines that never intersect?

More than two dozen Sandia volunteers read questions, kept score, and tracked time at the full-day event hosted at Albuquerque's Highland High School. Albuquerque Academy took first, Eisenhower Middle School in Albuquerque took second, and Los Alamos Middle School took third.

What specific structure is most directly responsible for the motility of bacteria?

Lily, from the winning Albuquerque
Academy team, says her favorite part of
Science Bowl is "the satisfaction when you
win. And you learn a lot of strategy."

Gaby, from Immanuel Lutheran's JV team, says her favorite part is "getting to hang out with my friends."

Most nuclear reactors in the US use what element as their fuel for fission?

The New Mexico High School Science Bowl will be held Feb. 27 and the DOEhosted national competition is held in Washington, D.C., April 30 through May 4.











Answers: Parallel; Flagellum or Flagella; Uranium or U-235

Sandians honored with Black Engineer of the Years awards

Personal commitment is integral to Ken Holley's professional accomplishments

en Holley didn't set out to become a renowned Sandia recruiter and a deeply involved and committed leader in the community when he joined the Labs 30 years ago, but it sure worked out that way.

In recognition of the way things worked out — both in his work and in the community — Ken has been named a recipient of the 2016 Black Engineer of the Year (BEYA) award in Community Service.

"When I came to Sandia, I was simply looking for a job that would allow me to stay close to home and raise a family," Ken says. "I didn't have any particular vision as to what my career would look like.

"I started to think of my role at Sandia as something more than a job when I got a DOE assignment to run a startup program called the Science and

KEN HOLLEY

Technology Alliance, whose purpose was to increase the number of minorities in engineering and technology."

Ken worked with three universities — New Mexico Highlands, North Carolina A&T, and the University of Turabo in Puerto Rico — to recruit the most promising prospects to work at the Labs. Ken not only initiated the program, he created internships and an innovative mentorship program that was the first of its kind at the Labs.

Retention issues posed a special challenge

"The program's success," Ken says, "allowed me to create my vision around recruiting and around Sandia's potential impact on engineering education and the diversity of the engineering workforce."

Ken found out pretty quickly that recruiting top minority students was one thing; retaining those students as employees was another matter altogether.

"We recruited outstanding talent to Sandia, but we realized we were losing them too often," he notes. In many cases, the student might represent the first member from his or her family to attend college, they were often far from home, and the desert Southwest was as different from their own hometowns as one could imagine. Then, too, in the case of young African Americans, they were coming to a community with a black population of just 3 percent.

Ken recognized the urgency of mentoring not just the engineer, the scientist, or the business professional, but the whole person. Ken took a personal, individual interest in each of his recruits. He introduced them to the community, to places to shop, to worship, to live. And his efforts paid off: Many of the students who went through the program are still at Sandia, some in management positions. Others went on to pursue advanced degrees as a result of their Sandia experience.

Ken wasn't just focused on college recruits. He understood from the beginning that the door to opportunity must be opened much earlier than that. That's why, in the more than 20 years since its inception, Ken has been dedicated to the HMTech program, which focuses on improving education outcomes for students in grades K-12 and inspires them to engage in STEM disciplines. He is also a very involved member of Alpha Phi Alpha, a fraternity encouraging academic excellence in youth, and many other education-focused organizations. He served on the board of directors for the Albuquerque Academy and is an active participant in various Christian ministries in the community.

Community, professional lives intersect

Ken sees community service as a holistic marriage of his personal and professional life.

"Community service was never a goal for me," he says. 'It was and remains a result of life activities. My goal and the goal of the organizations where I participate have a focus on giving back to the community, both locally and nationally. This local community work has been the foundation of national recruiting efforts with the universities where we recruit, especially for the Historically Black Colleges and Universities with their potential to produce excellent talent for Sandia."

In a career marked by many successes, Ken says he wishes he had a chance to do a couple of things over again.

"I believe we are all guilty of this 'would have, should have, could have' syndrome in life," he says. "Five minutes after any event, we know exactly what we should have said or done differently. It would have been nice to have a couple of mulligans — do overs — as they say in golf. I could have fought harder in all areas. Of course, there were people, really good people, we lost simply because of a lack of

February is Black History Month

Black History Month is celebrated annually during February to remember and celebrate the achievements of black Americans and the central role of African Americans in US history.

The story of Black History Month begins in 1915 when historian Carter G. Woodson and Minister Jesse E. Moorland founded the Association for the Study of Negro Life and History, dedicated to researching and promoting achievements by black Americans and other peoples of African descent. Now known as the Association for the Study of African American Life and History, the group sponsored a national Negro History Week in 1926.

Mayors across the country began issuing yearly proclamations recognizing Negro History Week. In the late 1960s, due to the Civil Rights Movement and a growing awareness of black identity, Negro History Week evolved into Black History Month. President Gerald Ford officially recognized Black History Month in 1976, calling upon the public to "seize the opportunity to honor the too-often neglected accomplishments of black Americans in every area of endeavor throughout our history." Each American president since then has designated February as Black History Month and endorsed a theme. The 2016 theme is "Hallowed Grounds: Sites of African American Memories."

time or resources at that moment in time."

Ken is retiring from the Labs this month after a storied career. And even without the mulligans, he looks back with pride over his role and Sandia's role as a leader in its efforts to diversify the workforce.

"This lab has made great strides in diversity," he says, noting that Sandia has NNSA's first woman lab president, a woman as executive VP, and the first black woman VP of human resources.

"These are surprising and wonderful changes for our lab.

I marvel at our potential to make a difference while accomplishing our national security mission. I will miss being here but I know Sandia will continue to do great work through great people."

Ken earned his BA at Winston Salem State University in North Carolina and an MBA at Oral Roberts University.

He and fellow Sandian Conrad James (see below), a recipient of a 2016 BEYA Special Recognition award, will be honored at the annual BEYA STEM conference in Philadelphia Feb. 18-20.

— Bill Murphy

Conrad James wins BEYA Special Recognition award

By Neal Singer

ue to his varied accomplishments and extraordinary range of interests, Conrad James (1714) will receive the 2016 Black Engineer of the Year (BEYA) Special Recognition award at the annual BEYA STEM conference in Philadelphia, Feb. 18-20.

Conrad's research interests include electrokinetic phenomena, neural engineering, and biomedical microfluidic devices. He holds six patents, has published 28 journal articles and book chapters, and now leads a Sandia Grand Challenge LDRD project to develop neural-inspired algorithms

and computing hardware to automate and accelerate analysis of data-intensive problems.

He also has spent a considerable amount of time helping students improve their skill in science and engineering courses.

But there's more. In addition to his pedagogical and technical interests,

Conrad is serving his second term as a member of New Mexico legislature, and also served on the Board of Regents at the University of New Mexico from 2013 to 2014.

Says Center 1700 Director Dave Sandison, "On rare occasions, an accomplished scientist will apply their leadership and problem-solving skills in other arenas, and Conrad is such a rare individual."

A different way of addressing public policy

Conrad, asked why the father of three is willing to diversify his time so greatly, replies, "I feel engineers and scientists need to be more involved in policy-making, especially in areas outside of traditional topics that we often weigh in on, such as climate change. We have an interesting way of solving problems that is very different from people with other professional backgrounds."

A National Merit semifinalist and valedictorian of his Columbus, Ohio, high school class, Conrad's first publication originated from a high school internship at a hospital for children in which he assembled data to help guide the proper treatment for hemophiliac children with head trauma.

"The aim of that work was to improve the outcomes for injured patients and to develop metrics by which to guide the hospital staff," he says.

He graduated summa cum laude from the University of Notre Dame with a bachelor's degree in electrical engineering. While an undergraduate, he spent three summers as an intern at Abbott Laboratories in quality assurance, electrical engineering, and computer-aided design.

Later, he received his master's and doctorate in applied

and engineering physics from Cornell. While a graduate student, he helped developed patterning techniques for constructing networks of living neurons, with applications to eventually restore lost functionality in patients with damaged neural tissue. He also published several articles on using microelectrode array devices to characterize electrically active cells such as neurons and chromaffin cells, Sandia Div. 1000 VP Rob Leland wrote in his letter supporting Conrad's BEYA application.

Stood out as a bright student

Conrad was hired in 2002 as a senior member of Sandia's technical staff by Dave, who first met Conrad when recruiting at Cornell University in November 2001. "He stood out as a very bright scientist who considered the broader impact and context of his work. I believed Conrad's abilities and interests would strengthen our application of microfluidics, and his many national and international presentations have done just that," Dave says.

At Sandia, Conrad became interested in electrokinetic phenomena in microfluidic systems, and published papers on electric field-mediated separation and concentration of particles for biological detection applications. He also developed platforms for studying immune response in individual host cells, using microfluidic systems coupled with impedance monitoring and fluorescent markers. This technology focuses on single-cell response dynamics rather than bulk population studies where cell responses are averaged out and details are lost.

Most recently, Conrad is using his background in neural engineering to investigate designing and fabricating microelectronic devices for brain-inspired computing applications.

Says senior manager Wahid Hermina (1710), "Conrad's combination of expertise in microscience and bioscience, and his ability to work well in teams and lead them, has made him an ideal choice to lead a multimillion dollar grand challenge research project focused on development of a neural-inspired computer."

Then there is Conrad's outreach to students. As an undergraduate at Notre Dame, he tutored freshmen and sophomore engineering students in calculus. As a graduate student, he participated in the Saturday Science and Math Academy, a community program designed to promote math, science, and technology to minority students in elementary and junior high school. For that effort, he helped devise physics demonstrations as well as robotics and computer programming tutorials. After moving to Albuquerque, he volunteered for the Sandia-sponsored Hand-on Minds-on Technology program for junior high and high school students where he assisted with courses in standardized test preparation, robotics, and math puzzles.

Says manager Steve Casalnuovo (1740), "Conrad's BEYA Special Recognition Award confirms what his co-workers have always known: Conrad is a creative researcher with strong technical leadership abilities who is also dedicated to improving his community."



CONRAD JAMES